Remarks

Claims 1-24 are pending. Claims 25-32 were previously withdrawn from further consideration by the Examiner as being drawn to a non-elected invention on the grounds that there is no allowable generic or linking claim.

In response to the previous Office Action, Applicants amended claims 1, 2, 4, 5, 8, 11-13, 16, 18, 19, 22 and 23. For the reasons discussed below, no further amendments are being made in this Response to the final Office Action. Reconsideration and allowance of all claims, as previously amended, are requested for the reasons discussed below.

Applicants' Amendment filed on or about April 14, 2003 in response to the Office Action mailed January 13, 2003 included arguments as to why all of the claims, as amended, should be allowed. On page 8 of the final Office Action, under the heading "Response to Arguments," the Examiner states that those arguments were considered but were not found persuasive. The Examiner's reasons why the arguments were not found persuasive state in part:

> 8. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., two separate and distinct chambers, e.g., reformer tubes) are not cited in the rejected claim(s). ... (Emphasis added).
>
> 9. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., each of the two reaction chambers receiving independent feed) are not recited in the rejected claim(s). ... (Emphasis added).

Applicants respectfully disagree with the above-quoted statements, since the features upon which Applicants rely are recited in the rejected claims.

Independent claims 1 and 2, both in the original claims and the amended claims, included "a first reaction chamber" and "a second reaction chamber." Similarly, independent claim 16, both in the original claim and the amended claim, included "a first reformer tube" and "a second reformer

tube."

The first and second reaction chambers referred to in claims 1 and 2, and the first and second reformer tubes referred to in claim 16, are shown clearly in the drawings. For example, the embodiment of Applicants' reformer shown in Figure 2 of their application includes a first reaction chamber 22 (or first reformer tube) and a second reaction chamber 26 (or second reformer tube). Figures 6-8 show other arrangements of other embodiments which include a first reaction chamber (or first reformer tube) and a second reaction chamber (or second reformer tube).

The specification of Applicants' application provides support at several places for Applicants' interchangeable use of the terms "reaction chamber" and "reformer tube." See for example the statement at page 4, lines 14-16:

> In a preferred embodiment, the reaction chambers, which preferably are tubular devices, are reformer tubes. The tubular devices may be reformer radiant tubes or tube-in-tube devices. (Emphasis added).

See also the specification at page 6, lines 9-11:

> In a preferred embodiment of this embodiment, the reaction chambers, which preferably are tubular devices, are reformer tubes. The tubular devices may be reformer radiant tubes or tube-in-tube devices. (Emphasis added).

Additional support is provided at page 11, lines 16-22, and in dependent claims 6 and 7 (which depend from independent claim 2) wherein the first and second reaction chambers are identified as a tube-in-tube.

In addition, the amendments to independent claims 1, 2 and 16 in Applicants' Amendment filed on or about April 14, 2003 provided that each of the two reaction chambers (or reformer tubes) receive an independent feed. Specifically, claims 1, 2 and 16 were amended to state that the first reaction chamber (or first reformer tube) is "adapted to receive a first portion of a mixed-feed," and the second reaction chamber (or second reformer tube) is "adapted to receive a second portion of said mixed-feed or another mixed-feed." As pointed out in footnote 1 on page 12 of the April 14,

2003 Amendment, support for those amendments in claims 1, 2 and 16 appears in Figures 2, 6-8 and 19 of the drawings, and in the specification at page 12, lines 3-13 and lines 17-21; page 12, line 25 to page 13, line 2; and page 13, lines 5-9.

Accordingly, Applicants' present arguments in response to the rejections in the final Office Action are similar to their arguments in the Remarks of their April 14, 2003 Amendment, since the rejected claims do recite the features upon which Applicants relied in those arguments: 1) two separate and distinct reaction chambers (*e.g.*, reformer tubes), and 2) each of the two reaction chambers (*e.g.*, reformer tubes) receiving independent feeds.

In view of the above, Applicants respectfully request that the Examiner reconsider Applicants' arguments below and allow claims 1-24, as previously amended. Applicants' previous arguments are renewed below and reinforced with additional arguments in response to the specific rejections set forth in the final Office Action.

The § 102 Rejections

The Examiner rejected claims 1-8, 11-18 and 21-22 under §102(b) as being anticipated by Ohsaki, *et al.* (U.S. Pat. No. 5,199,961). The Examiner took the position that this reference discloses all of the elements of Applicants' claimed invention as set forth in the rejected claims and that the rejected claims structurally read on the apparatus of Ohaski, *et al.* For the reasons set forth below, Applicants respectfully disagree.

Ohsaki, *et al.* does not disclose an apparatus for a hydrocarbon reforming process having all of the elements in independent claims 1, 2, and 16, and in dependent claims 3-8, 11-15, 17, 18, 21 and 22. In particular, Ohsaki, *et al.* does not disclose two separate and distinct reaction chambers (*e.g.*, reformer tubes) - - one inside the combustion chamber and the other inside the convection chamber - - as in claims 1, 2, and 16. Rather, Ohsaki, *et al.* discloses only a single type of tube 10, part of which is in the radiant heat transfer space 110 and part of which is in the convection heat

transfer space 120.

Since Applicants' invention, as claimed in independent claims 1, 2, and 16 and in dependent claims 3-8, 11-15, 17, 18, 21 and 22, includes at least one feature (*e.g.*, a first reaction chamber or reformer tube inside the combustion chamber, and a second reaction chamber or reformer tube inside the convection chamber) that is not disclosed by Ohsaki *et al.*, withdrawal of the rejection of claims 1-8, 11-18 and 21-22 is required.

In addition to the fact that Ohsaki, *et al.* is distinguishable from Applicants' original claims for the reasons discussed above, that reference also is further distinguishable from Applicants' previously amended claims. In their April 14, 2003 Amendment Applicants voluntarily amended independent claims 1, 2, and 16 in the manner discussed below to more clearly and distinctly claim their invention.[1] However, by amending those claims for clarification, it became apparent that there are one or more additional differences between Applicants' claimed invention and the cited references, including Ohsaki, *et al.*

Applicants' claimed invention in amended independent claims 1, 2, and 16 is different from Ohsaki, *et al.* in that it has two independent feeds to two separate reaction chambers (or reformer tubes). Specifically, the following elements in amended independent claims 1, 2, and 16 are not disclosed in Ohsaki, *et al.*:

> a first reaction chamber adapted to receive a first portion of a mixed-feed, a substantial portion of said first reaction chamber disposed in said at least one combustion chamber; and
>
> a second reaction chamber adapted to receive a second portion of said mixed-feed or another mixed-feed, a substantial portion of said second reaction

[1] As previously mentioned, support for the amendments appears in Figures 2, 6-8, and 19 of the drawings, and in the specification at page 12, lines 3-13 and lines 17-21; page 12, line 25 to page 13, line 2; and page 13, lines 5-9.

chamber disposed in said at least one convection chamber.[2]

In the embodiment of Applicants' reformer shown in Figure 2 of their application, a first reaction chamber 22 which receives a first portion of the mixed-feed through inlet 38 is located in the combustion chamber 16, and a second reaction chamber 26 which receives a second portion of the mixed-feed (or another mixed-feed) through inlet 34 is located in the convection chamber 18. (See also the arrangements shown in Figures 6-8). Ohsaki, *et al.* does not teach or disclose such an arrangement of separate first and second reaction chambers (or reformer tubes) located inside the combustion and convection chambers respectively, each of the two reaction chambers (or reformer tubes) receiving an independent feed. Therefore, Applicants' claimed invention is significantly different than Ohsaki, *et al.* both structurally **and** in arrangement.[3]

Since Applicants' invention includes at least one feature (previously discussed) that is not disclosed by Ohsaki, *et al.*, withdrawal of the rejection under § 102 is required. Even assuming, *arguendo*, that Ohsaki, *et al.* discloses all of the elements of Applicants' invention, withdrawal of the § 102 rejection is required because Ohsaki, *et al.* does not disclose each element of Applicants' claimed invention arranged as in the previously amended claims.

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[2] The quoted language appears in amended claims 1 and 2. The same language appears in amended claim 16, except that "reformer tube" is used instead of "reaction chamber."

[3] Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. It is not enough, however, that the reference disclose all the claimed elements in isolation. Rather, the prior art reference must disclose each element of the claimed invention *"arranged as in the claim."* *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added). Thus, even if a prior art reference includes all the elements that are claimed, if the arrangement of the claimed elements is different from the arrangement of the prior art elements, anticipation will not be present. Further, anticipation will not be found when the prior art is lacking or missing a specific feature of the structure of the claimed invention. "Every element of the claimed invention must be literally present, *arranged as in the claim*." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989) ("The identical invention must be shown in as complete detail as is contained in the... claim.") (emphasis added) *See*, the comment in MPEP § 2131.

For all of the foregoing reasons, withdrawal of the rejection under § 102 is requested.

The § 103 Rejections

The Examiner rejected claims 1-24 under § 103(a) as being unpatentable over Makabe, *et al.* (U.S. Pat. No. 5,226,928) in view of Ohsaki, *et al.* (U.S. Pat. No. 5,199,961). In support of her rejection, the Examiner made several statements which Applicants respectfully disagree with for the reasons set forth below.

For example, the Examiner stated: "Regarding claim(s) 1-2 and 16, Makabe, et al., in Fig. 3A, disclose(s) similar apparatus comprising: ... the second reaction chamber (O) adapted to receive a second portion of mixed-feed or another mixed-feed, a substantial portion of said second reaction chamber (O) disposed in said convection chamber (24) ...." (Emphasis added). Contrary to this assertion, Makabe, *et al.* does not disclose two reaction chambers, including a second reaction chamber adapted to receive a second portion of a mixed-feed or another mixed-feed. Rather, this reference discloses a single continuous reaction chamber, not two separate and distinct reaction chambers (or reformer tubes) as in Applicants' claimed invention. Therefore, Makabe, *et al.* does not remedy the deficiency in Ohsaki, *et al.*, which also does not disclose two separate and distinct reaction chambers (or reformer tubes), as discussed with regard to the § 102 rejection above.

In support of the § 103 rejection, the Examiner also stated: "Regarding claim(s) 3, 17 and 21, Makabe, et al. in view of Ohsaki, et al. disclose(s) all of the claimed limitations as forth above. Additionally, Ohsaki, et al. discloses the apparatus further comprising: - communication means between a first reaction chamber (located in a combustion chamber) and said second reaction chamber (located in a convection chamber), whereby a fluid flows from or to said first reaction chamber to or from said second reaction chamber (Fig. 1)." (Emphasis added). However, as

discussed above with regard to the § 102 rejection based on Ohsaki, *et al.* and with regard to the § 103 rejection of claims 1, 2 and 16, neither Ohsaki, *et al.* nor Makabe, *et al.* disclose two separate and distinct reaction chambers (*e.g.*, reformer tubes) -- one inside the combustion chamber and the other inside the convection chamber.

Moreover, since independent claims 1, 2 and 16 are non-obvious under § 103 (as the Examiner has not made a *prima facie* case of obviousness with regard to claims 1, 2 and 16), dependant claims 3, 17 and 21 which depend from claims 1, 2 and 16 also are non-obvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). Therefore, the rejection of claims 3, 17 and 21 under § 103 should be withdrawn.

For the same reasons, the § 103 rejections should be withdrawn with regard to dependent claims 4-7, 8-15, 18-20, and 22-24, all of which the Examiner rejected over Makabe, *et al.* in view of Ohsaki, *et al.* Since each of these dependent claims depend from an independent claim (1, 2 or 16) which is non-obvious under § 103 (as the Examiner has not made a *prima facie* case of obviousness with regard to claims 1, 2 and 16), those dependent claims also are non-obvious. *In re Fine, supra*. Therefore, the rejection of dependent claims 4-7, 8-15, 18-20 and 22-24 under § 103 should be withdrawn.[4]

In addition, the § 103 rejection of claims 1-24 is improper because there is no teaching, suggestion, or motivation to combine Makabe, *et al.* with Ohsaki, *et al.* to produce Applicants' claimed invention. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430, 1432 (Fed. Cir. 1990); *In re Fritch*, 972 F.2d 1260,

[4] With regard to claims 4-7, the Examiner also asserted that the cited references disclose certain elements, including first and second reaction chambers. However, as discussed above, neither Makabe, *et al.* nor Ohsaki, *et al.* disclose two separate and distinct reaction chambers (*e.g.*, reformer tubes) -- one inside the combustion chamber and the other inside the convection chamber.

1265-66, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992); *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000). Since the prior art does not suggest the desirability of combining the cited references, the Examiner has not made a *prima facie* case of obviousness.

On page 8 of the final Office Action, the Examiner states that: "obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art." (Citations omitted.) In rejecting claims 1-24 as obvious, the Examiner took the position that there is some motivation to combine the cited references:

> In this case, the motivation to combine is provided in the reference themselves, specifically, Ohsaki, et al. teaches that it is known to increase the capacity of reforming apparatus by, among others, increasing the number of reforming tubes (C1/L51-C2/L8), and that disclosed arrangement provides high capacity apparatus with high heat recovery efficiency and a lower energy consumption (C1/L4-9) without increasing the size of said apparatus (C2/L23-28).

Applicants respectfully disagree that the cited portions of Ohsaki, *et al.* provide a motivation to combine that reference with Makabe, *et al.* to produce Applicants' claimed invention. Although Ohsaki, *et al.* may teach that the capacity of a reforming apparatus may be increased by increasing the number of reforming tubes and that the arrangement of Ohsaki, *et al.* provides a high capacity apparatus with high energy recovery efficiency and lower energy consumption without increasing the size of the apparatus, that alone does not teach, suggest, or provide a motivation to combine Ohsaki, *et al.* with Makabe, *et al.*

Moreover, even when combined, Ohsaki, *et al.* and Makabe, *et al.* do not yield Applicants' claimed invention. As previously discussed, these references are deficient since they do not disclose an apparatus for a hydrocarbon reforming process having all of the elements and

limitations taught in Applicants' claimed invention. Neither the references alone, nor a combination of the references, disclose or teach an apparatus for a hydrocarbon reforming process having two separate and distinct reaction chambers (*e.g.*, reformer tubes) -- one inside the combustion chamber and the other inside the convection chamber -- as in claims 1, 2 and 16, as previously amended.

Moreover, it is improper to combine the cited references because those references do not address or solve the problems addressed by Applicants' claimed invention, nor do the references appreciate the advantages of Applicants' claimed invention. Therefore, the § 103 rejection of independent claims 1, 2, and 16 based on the combination used by the Examiner is inappropriate. *See, In re Fine*, 837 F.2d 1071, 1075-76, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988); and *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 679, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988) (problem confronted by the inventor must be considered in determining whether it would have been obvious to combine references in order to solve that problem).

For example, Applicants' claimed invention addresses, *inter alia*, the problem of utilizing the high grade sensible heat of flue gas and product synthesis gas to generate additional product gas and minimize steam export. Neither of the cited references address that problem.

Contrary to the Examiner's suggestion, this is not a case where Applicants have merely "recognized another advantage which would flow naturally from following the suggestion of the prior art... when the differences (between the invention and the prior) would otherwise be obvious." The solution to the problems which Applicants addressed and the advantages of their invention are not suggested by the prior art and do not flow naturally from any suggestion in the prior art. Moreover, as previously discussed, the differences between Applicants' invention and the prior art are not obvious.

Although Makabe, *et al.* does involve a reforming apparatus, the object of Makabe, *et al.* is to

provide a compact reforming apparatus that is suitable for a fuel cell application. The object of Ohsaki, *et al.* is to provide a catalytic reaction apparatus that utilizes flue gas sensible heat in the upper part of the furnace and an equalizing plate in the lower part of the furnace. Since the cited references, individually or in combination, do not address the problems solved by Applicants' claimed invention or appreciate the advantages of Applicants' claimed invention, these references cannot be used to render obvious any of the pending claims.

As discussed above with regard to the § 102 rejection, the structure and the arrangement of the elements of Applicants' claimed invention are significantly different from the cited references. Neither of the references remedies the deficiencies of the other cited reference with respect to the claimed invention. Even when combined, the references do not yield Applicants' claimed invention.

One skilled in the art would not combine the references cited by the Examiner in support of the § 103 rejections, because the combinations would not teach anything relevant to the field of the invention. Even when combined, the references are deficient since they do not disclose an apparatus for a hydrocarbon reforming process having all of the elements and limitations taught in Applicants' claimed invention.

Finally, as previously noted, the Examiner has not established a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03, citing *In re Royka*, 490 F.2d 981, 180 USPQ 580 (C.C.P.A. 1974). Since there are features (previously discussed above) in the previously amended claims of Applicants' claimed invention that would not be obvious to one skilled in the art, the Examiner has not established a *prima facie* case of obviousness. Neither of the references (nor a combination of the references) cited by the Examiner disclose those features.

Accordingly, for all of the above reasons, the rejection of claims 1-24 under § 103 should be withdrawn.

Conclusion

For all of the foregoing reasons, Applicants respectfully submit that all of the pending claims are patentable over the art of record, are in condition for allowance and request withdrawal of the remaining rejections..

Respectfully submitted,

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